

6.3

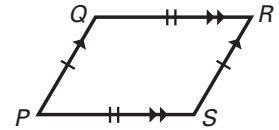
Showing Quadrilaterals are Parallelograms

Goal Show that a quadrilateral is a parallelogram.

THEOREM 6.6

Words If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

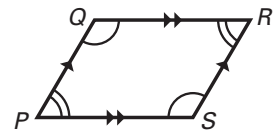
Symbols If $\overline{PQ} \cong \overline{SR}$ and $\overline{QR} \cong \overline{PS}$, then $PQRS$ is a parallelogram.



THEOREM 6.7

Words If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Symbols If $\angle P \cong \angle R$ and $\angle Q \cong \angle S$, then $PQRS$ is a parallelogram.



Follow-Up

Write the converse of Theorem 6.6. Is the converse true or false? How do you know?

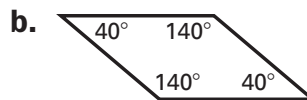
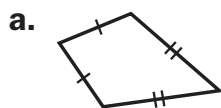
If a quadrilateral is a parallelogram, then both pairs of opposite sides are congruent; true; this is Theorem 6.2.

Write the converse of Theorem 6.7. Is the converse true or false? How do you know?

If a quadrilateral is a parallelogram, then both pairs of opposite angles are congruent; true; this is Theorem 6.3.

Example 1 Use Theorems 6.6 and 6.7

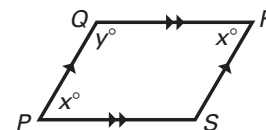
Tell whether the quadrilateral is a parallelogram. Explain.

**Solution**

- a. No. The quadrilateral is not a parallelogram because it has two pairs of congruent sides, but opposite sides are not congruent.
- b. Yes. The quadrilateral is a parallelogram because both pairs of opposite angles are congruent.

THEOREM 6.8

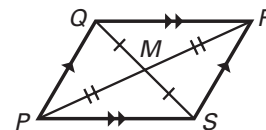
Words If an angle of a quadrilateral is supplementary to both of its consecutive angles, then the quadrilateral is a parallelogram.



Symbols If $m\angle P + m\angle Q = 180^\circ$ and $m\angle Q + m\angle R = 180^\circ$, then $PQRS$ is a parallelogram.

THEOREM 6.9

Words If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.



Symbols If $\overline{QM} \cong \overline{MS}$ and $\overline{PM} \cong \overline{MR}$, then $PQRS$ is a parallelogram.

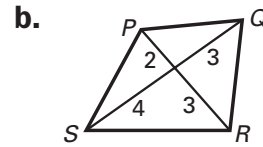
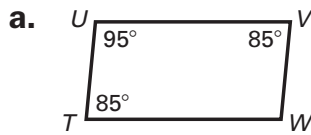
Follow-Up

Write the converse of Theorem 6.8. Is the converse true or false? How do you know?

If a quadrilateral is a parallelogram, then an angle is supplementary to both of its consecutive angles; true; this is Theorem 6.4.

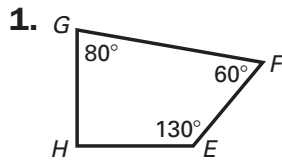
Example 2 Use Theorems 6.8 and 6.9

Tell whether the quadrilateral is a parallelogram. Explain your reasoning.

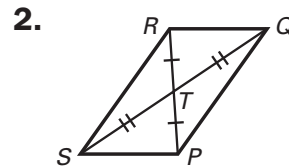
**Solution**

- a. Yes. This quadrilateral is a parallelogram because $\angle U$ is supplementary to both $\angle T$ and $\angle V$. ($85^\circ + 95^\circ = 180^\circ$)
- b. No. This quadrilateral is not a parallelogram because the diagonals of the quadrilateral do not bisect each other.

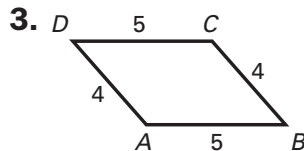
✓ **Checkpoint** Tell whether the quadrilateral is a parallelogram. Explain your reasoning.



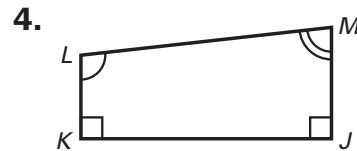
No; consecutive angles are not supplementary.



Yes; diagonals bisect each other.



Yes; both pairs of opposite sides are congruent.



No; opposite angles are not congruent.